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STORM WATER PATHWAY EVALUATION WORK PLAN

Kinder Morgan Liquid Terminals, LLC
Linnton Terminal
11400 NW St. Helens Road
Linnton, Oregon

DEQ ECSI File No. 1096
Delta Project No. PTKM-0107

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STORM WATER PATHWAY EVALUATION WORK PLAN

**KINDER MORGAN – LINNTON TERMINAL
11400 NW ST. HELENS ROAD
LINNTON, OREGON
DELTA PROJECT NO. PTKM-010-7**

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1.0 INTRODUCTION

On behalf of Kinder Morgan Liquid Terminals, LLC (Kinder Morgan), Delta Environmental Consultants, Inc. (Delta) has prepared this work plan to evaluate the storm water source pathway for the Kinder Morgan Linnton Terminal (Site). The Work Plan is being submitted at the request of the Department of Environmental Quality (DEQ) to support the ongoing evaluation of potential upland sources for impacts to the Willamette River in the vicinity of the Portland Harbor Superfund site.

1.1 Background

The Portland Harbor Superfund Site is an approximate 12-mile stretch of the Willamette River (extending from downtown Portland to the confluence of the Columbia River) that has been heavily developed by various industries over the last century. The Kinder Morgan Linnton Terminal is situated within this stretch of the Willamette River.

In December 2000, the Portland Harbor was added to the National Priorities List (NPL). The final NPL listing specifies that the US Environmental Protection Agency (EPA) is the lead agency for the in-water portion of the remedial investigation and feasibility studies, while the DEQ is the lead agency for the upland portions.

Consistent with the Joint Source Control Strategy (JSCS) developed jointly by the DEQ and EPA in December 2005, identification and mitigation of upland sources of contamination to the Willamette River and associated aquatic sediments is necessary to facilitate future cleanup actions in the Portland Harbor. As the lead agency for upland sources, the DEQ requested Kinder Morgan prepare and submit this Work Plan to address the upland storm water pathway from the Linnton Terminal consistent with the JSCS document requirements.

1.2 Scope

The DEQ and EPA have identified three primary pathways by which the Willamette River and associated aquatic sediments have been impacted by upland constituents of interest (COIs):

- Overland run-off (including bank erosion)
- Groundwater discharge to river
- Storm Water

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The scope of this Work Plan is to assess the storm water pathway at the Site consistent with the December 2005 JSCS. Specifically, the scope will assess if chemicals in Site storm water are migrating to the Willamette River at concentrations that pose an unacceptable risk to human health or the environment.

The work proposed herein focuses first on sampling and analyzing the Site's catch basin sediments to obtain a time-integrated snapshot of potential COI discharges to the Willamette River. The results of catch basin sediment sampling will identify if the Site storm water is a potentially complete storm water pathway warranting further evaluation through screening of storm water discharges over the coming wet season. In order to facilitate the review and approval process, this work plan also proposes a follow-up storm water sampling plan to be implemented if potential COI discharges require further evaluation.

2.0 SITE OVERVIEW

2.1 Setting

The Linnton Terminal is located at 1400 NW St. Helens Road in Linnton, Multnomah County, Oregon. The approximate 13-acre Site is situated on the west bank of the Willamette River between River Mile (RM) 5 (upstream) and RM 4 (downstream) within the boundaries of the Portland Harbor Superfund Site study area. Overall, the topography gently slopes toward the Willamette River, although there is a steep embankment and retaining wall adjacent to the shore.

The Site is bounded to the north-northwest by undeveloped land (formerly Linnton Planing Mill); to the east-northeast by the Willamette River; to the south-southeast by a largely undeveloped property used for the storage of steel beams, sheet piling, and pipes; to the south by residences, and to the southwest by the Portland & Western Railroad with commercial businesses beyond.

The Site is currently developed with 32 above-ground storage tanks (ASTs) with an estimated capacity of approximately 20,000,000 gallons, associated piping, and ancillary equipment. The AST farms are

enclosed in concrete walls for secondary containment purposes. The floors of the AST farms are typically gravel and/or native soil materials. In addition, the Site is developed with tanker truck loading racks, rail car loading racks, a dock facility used for off-loading of fuel from barges and ships, four warehouses, one maintenance shop, and an office (see Figure 1).

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2.2 Historical Operations

The Site has been developed for bulk petroleum storage and distribution since approximately 1903, when it was acquired by Associated Oil. The first ASTs were constructed in approximately 1918. The Site has a history of ownership including acquisitions by Tidewater (1937), Philipps (1966), GATX (1976), and Kinder Morgan (2001). The use of the Site prior to 1903 is unknown.

Before 1976, a variety of petroleum products including gasoline, white gas, kerosene, diesel, lube oils, industrial oils, greases, and solvents were stored at the Site (Delta, October 2002). Other activities historically conducted at the Site included cleaning and painting of drums, storage and distribution of vehicle tires, batteries, and other accessories, and distribution of bulk goods and canned products to area service stations. Currently, gasoline, diesel, lube oils, ethanol, and used oils are stored at the Site. The ASTs are connected to the Olympic Pipeline and the SFPPLP (formerly Santa Fe Pacific Pipeline) via a piping system at the southern end of the Site.

2.3 Potential Contaminant Sources

2.3.1 Historic Releases

Between July 1972 and October 1998, small documented releases of petroleum products including gasoline (leaded and unleaded), diesel, fuel oil, and oil were reported at the Site. Investigations of subsurface conditions at the Site were initiated in 1992, upon the discovery of dissolved-phase petroleum hydrocarbon constituents in a monitoring well on the Linnton Planing Mill property (north of the Site). Following a December 1994 diesel release, the first monitoring wells (MW-1 through MW-3) installed in the vicinity of the release and contained varying thicknesses of separate-phase hydrocarbons (SPH). SPH recovery activities were initiated in October 1995 and have continued to the present. Currently, SPH is managed using a 5-well hydraulic containment recovery system designed to cutoff SPH migration from the site.

2.3.2 Previous Investigations

KHM Environmental Management, Inc. (KHM) conducted a Remedial Investigation (RI) at the Site in January 2002. A total of 28 surface soil samples and two sediment samples from the base of the retaining wall adjacent to the Willamette River were collected and analyzed. In addition, 63

soil boring samples, 19 groundwater samples and four groundwater seep samples were also analyzed. The RI identified concentrations of the following Constituents of Potential Concern (COPCs) in soil that exceeded initial risk-based screening levels: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno (1,2,3-cd)pyrene, n-propylbenzene, lead, benzene, naphthalene, chromium, and arsenic. COPCs above initial risk-based screening levels in groundwater included 1,2-dichloroethane (1,2-DCA), benzene, naphthalene, and n-propylbenzene.

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2.4 Storm Water Management

2.4.1 Current Operations

Storm water is currently managed consistent with the Site's National Pollutant Discharge Elimination System (NPDES) 1300-J permit. The Site is currently in compliance with the requirements of the 1300-J NPDES permit.

Delta gathered available information regarding storm water management practices from a variety of sources including as-built drawings, interviews with Site employees, NPDES permits, and on-site observations. The information gathered was used to generate a schematic (Figure 1) that conceptually depicts major elements of the storm water management system including drainage basins, catch basins, oil/water separators, outfalls, subsurface piping, and surface sheetflow. Storm water management practices for the Site are described below:

Storm water runoff at the Site is collected in two drainage basins, designated A and B, each with a dedicated oil/water separator (see Figure 1). Storm water in Basin A (truck loading, offices, and warehouse buildings) is directed by subsurface piping and/or surface sheetflow to oil/water separator No. 1. Storm water from Basin B (consisting largely of the upper and lower AST yards) is directed to catch basins by a combination of subsurface piping and/or surface sheet flow to oil/water No. 2.

Storm water from both oil/water separators is routed to batch tank No. 3034 (capacity of approximately 125,000 gallons) for testing in accordance with the requirements of the general NPDES 1300-J permit (see Figure 1). After analytical results show the batched storm water meets NPDES permit standards, the batch tank is manually drained (approximate 125,000-gallon batches) through 4-inch discharge outfall WR-76 (see Figure 1 and Table 1). During the wet season (October through May) the batch tank is manually discharged one to two times per month with each discharge taking approximately one day to complete.

In the event the capacity of batch tank 3034 is exceeded, storm water runoff in drainage basins A and B is discharged directly to the Willamette River via two 8-inch outfalls after passing through oil/water separators (see Figure 1 and Table 1).

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2.4.2 Preventative Measures (Best Management Practices)

Petroleum products are containerized in ASTs, product piping, or hoses (during fuel transfer operations). The potential for petroleum products to come in contact with storm water is limited, except in the case of minor releases to the ground in the AST yards or during fuel transfer operations. Consistent with Best Management Practices (BMPs) for the Site, spills are immediately cleaned up with sorbents (granular materials or pads) and nearby catch basins are isolated with appropriate containment measures (dikes or berms). In addition, asphalt-paved areas adjacent to catch basins are swept as needed to minimize the potential for introduction of sediments into the storm water system.

2.4.3 Structural Controls

Structural Controls for the storm water system are intended to reduce the potential for COIs in storm water to reach the Willamette River. As discussed under Section 2.4.1, Site storm water is directed to one of two oil/water separators which physically segregate oily fluids from water. Subsequent to treatment at the oil/water separator, storm water is directed to a batch tank for compliance testing. Controlled discharges occur when testing reveals compliance with NPDES permit requirements, except in instances where the capacity of the batch tank is exceeded during high precipitation events (when this occurs, storm water is discharged to Willamette River after passing through the oil/water separators).

The oil/water separators and sumps (vicinity of truck loading rack) are visually inspected on a daily basis. Kinder Morgan performs general maintenance and upkeep of the oil/water separators and problems are addressed in a timely manner. Accumulations of oil or sediment in the oil/water separators and sumps are removed and disposed on an as-needed basis. In addition, catch basins are present throughout the Site for purposes of sediment control. The catch basins trap sediments entrained in the storm water and generally inhibit their discharge to the Willamette River.

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3.0 SEDIMENT SCREENING

The DEQ and EPA JSCS established a tiered approach for evaluation of the storm water pathway for upland sites bordering the Portland Harbor Superfund site. The first step is to evaluate whether Portland Harbor sediments are likely to be impacted by storm water runoff. Evaluation under this first tier requires sampling of representative catch basin sediments from the potential upland facility. Analytical data from catch basin sediments are compared to soil/storm water sediment Screening Level Values (SLVs) to identify COIs posing potential risks to human health and the environment. Concurrently, evaluations performed under the first tier should include a review of facility-specific operations to determine which of the COIs detected in catch basin sediments are attributable to the site in question. If warranted, the next step is to evaluate whether the COIs, identified in step 1, adversely impacted storm water discharges from the upland facility.

According to the JSCS guidance (DEQ, December 2005), the analytical methods applied to catch basin sediment and storm water samples should be based one or more of the following:

- Site-specific COIs detected during RI activities discussed in section 2.3.1 (Delta, 2002);
- Sampling required under a National Pollutant Discharge Elimination System (NPDES) permit;
- Analytical data for sediment samples collected from the Willamette River for the Portland Harbor by the Lower Willamette Group (LWG).

3.1 Remedial Investigation Results, Potential COI

Potential COI identified in during the RI activities described in section 2.3.1 include the following:

Metals	Arsenic, chromium, lead
PAHs	Benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, n-propylbenzene, and naphthalene
VOCs	Benzene, 1,2,-dichloroethane

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3.2 Portland Harbor Sediment Results, Potential COI

Part of the Portland Harbor Remedial Investigation includes characterizing the nature of contaminants in Willamette River sediments adjacent to points of storm water discharges. Delta identified the following Portland Harbor sediment sampling location near a discharge from the Linnton Site.

Sample ID	Date	Depth cm)	Study	Location
KM-08-A	December 2005	20	Round 2 Groundwater Pathway Assessment	Near WR-77 Outfall East of OW Separator No. 2

The above referenced sediment samples were analyzed for polychlorinated biphenyls (PCBs), metals (aluminum, antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc), polynuclear aromatic hydrocarbons (PAHs), pesticides, phenols, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs).

The following COIs were detected in the KM-08-A sediment sample:

Metals	Aluminum, antimony*, arsenic, cadmium, chromium*, copper, lead, manganese, mercury*, nickel, thallium, zinc, barium, beryllium
PAHs	Acenaphthene*, acenaphthylene*, anthracene*, fluorene*, 2-methylnaphthalene, phenanthrene, dibenz(a,h)anthracene*, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene
TPH	TPH as Diesel (TPH-D)

* = concentration estimated by laboratory

The constituents detected in the KM-08-A sediment sample are generally consistent with COIs identified during RI activities conducted by Delta in 2002.

In addition to COIs described previously, the DEQ has determined that analytical parameters for storm water investigations conducted at all upland sites should include PCB Aroclors and phthalates.

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4.0 SITE CHEMICALS OF INTEREST AND ANALYSES

Analytical parameters that will be used for screening of catch basin sediment samples were selected from COIs identified as part of the Linnton Terminal RI (Delta, 2002), Portland Harbor superfund site sediment sampling near the Site, and DEQ directives concerning analytical parameters for investigations conducted at upland sites.

Delta selected the following analytical parameters for screening of catch basin sediment samples:

- TPH as Gasoline (TPH-G) per Method NWTPH-Gx;
- TPH-D and TPH-O per Method NWTPH-Dx Extended;
- Risk-Based Decision Making VOCs per EPA SW-846 Method 8260B;
- PAHs using EPA SW-846 Method 8270 SIM;
- Total metals (aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, thallium, zinc, barium, and beryllium) by EPA SW-846 Method 6010B/7000;
- PCBs per EPA SW-846 Method 8082;
- Phthalates by EPA SW-846 Method 8270.

5.0 CATCH BASIN SEDIMENT SAMPLING PLAN

The scope of work presented herein is intended to satisfy the requirements for evaluation of the storm water pathway under Tier 1 as presented in the JSCS guidance. Screening of analytical data for catch basin sediment samples against soil/storm water sediment SLVs (Table 3-1 of JSCS) will be used to determine if further evaluation of the storm water pathway (i.e. collection of storm water samples) is warranted. It is widely accepted that properly sampled catch basin solids represent a time-integrated sample of potential contaminant loading to surface water bodies. Therefore, the detection in catch basin sediments of COIs at concentrations exceeding applicable SLVs would indicate that the potential for impacts to the Willamette River from storm water runoff warrants further study under Tier 2.

5.1 Catch Basin Sampling Locations

Based on site observations and information provided by Kinder Morgan employees, catch basins were identified as potential points of entry for sediments into the storm water system. Because storm water is directed to catch basins (and ultimately oil/water separators) by a combination of subsurface piping and surface sheet flow from all areas of the Site, Delta considers catch basin sediments to be representative

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of Site conditions. Specifically, Delta has identified five catch basins considered to provide representative coverage of drainage basins A and B (see Figure 1):

Catch Basin No.	Storm water Drainage Basin	Area of Site Serviced by Catch Basin
1	A	Truck Loading Rack
2	A	Asphalt Areas North of Loading Rack
3	A/B	North Side of Upper Tank Yard and Asphalt
4	B	Containment Area for Pumps
5	B	Upper and Lower Tank Yards

5.2 Catch Basin Sediment Sampling

It is anticipated that sampling of catch basin sediments would occur in October 2006, prior to the onset of the wet season. Completion of the sediment sampling as early in the fall season as practicable will facilitate submittal/approval of a Work Plan for storm water sampling (if deemed necessary and described below).

5.2.1 Sampling Procedures

Sampling of catch basin sediments will be done consistent with City of Portland guidance concerning collection methods for catch basins (CH2MHill, July 2003). The sample collection methods employed will depend on factors including catch basin geometry, thickness and consistency of the catch basin solids, and depth of standing water in the catch basins at the time of sampling. Delta will inspect the proposed catch basin sample locations prior to the sampling event for the purpose of making a preliminary determination regarding likely sample collection method(s).

All catch basin sediment samples will be placed in laboratory-provided containers, stored in a cooler on ice, and delivered to Test America Laboratories of Beaverton, Oregon, under chain-of-custody protocols. All analytical data will be subjected to a Quality Assurance (QA) review prior to screening against soil/storm water sediment SLVs. Delta will additionally collect a duplicate sediment sample from one sampling location for QA/QC purposes.

Delta field personnel will record comprehensive observations (including photographic documentation) to supplement and aid in the interpretation of analytical data. Delta will document site-specific conditions including catch basin geometry (i.e. dimensions and construction), standing water depth, and sediment thickness/consistency. Other conditions including odors, sheens, presence of product, or other debris will also be noted. If standing water is present in the catch basin, pH measurements will be collected in the field.

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5.2.2 Reporting

Following receipt of analytical data, Delta will prepare a letter report documenting the sediment sampling event. The report will present the results of the SLV screening and include recommendations for additional sediment sampling (if warranted). The report will also include laboratory analytical reports, COC documentation, and a description of conditions at the time of sampling. Concurrently, Delta will verbally notify the DEQ Project Manager of the sediment sampling results.

Delta anticipates that based on the results of the catch basin sediment sampling, the DEQ will determine that storm water sampling to complete the storm water pathway evaluation is warranted.

6.0 STORM WATER SAMPLING PLAN

The storm water sampling plan is intended to satisfy the requirements for a Tier 2 evaluation of the storm water pathway consistent with JSCS guidance.

6.1 Sampling Locations

As discussed under previous sections, Site storm water is batched in 125,000-gallon tank for compliance testing prior to discharge. Under normal conditions, storm water is discharged from a 4-inch private outfall (WR-76) with a typical frequency of one to two times per month during the wet season. If the capacity of the batch tank is exceeded during an extreme precipitation event, Site storm water is discharged directly to 8-inch private outfalls (WR-75 and WR-77) after treatment at the oil/water separators (Figure 1). The batching of Site storm water makes collection of "first flush" samples impracticable. As a result, the primary sampling point for storm water (under normal conditions) is the 4-inch outfall (WR-76). The secondary storm water sampling points are the 8-inch outfalls (WR-75 and WR-77) used only when the batch tank is bypassed during extreme precipitation conditions.

6.2 Sampling Frequency

Delta anticipates that four storm water sampling events will be conducted between November 2006 and May 2007. Delta proposes to collect samples from outfall WR-76 during three controlled discharge events. Additionally, samples will be collected from outfalls WR-75 and WR-77 during one storm event during which the batching process is bypassed due to extreme precipitation conditions (overflow event).

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Delta will coordinate with Site operators regarding the scheduling of planned discharge events. In addition, prior to an anticipated storm event of sufficient magnitude that the batch tank is likely to be bypassed, Delta will coordinate with Site operators to facilitate the sampling of at least one overflow event. Additional information will be obtained from the National Weather Service or United States Geological Survey rain gauges maintained in the Portland area.

6.3 Sampling Procedures

Grab samples will be collected during permitted discharges or overflow events in consistent with methods described in Washington Department of Ecology guidance (Attachment D, Appendix D, JSCS). Samples will be transferred into laboratory-provided sample containers and capped as soon as they are full. Care will be taken to ensure that the containers are not overfilled and sample contamination via contact with the container opening does not occur.

All storm water samples will be placed in laboratory-provided containers, stored in a cooler on ice, and delivered to Test America Laboratories of Beaverton, Oregon, under chain-of-custody protocols. All analytical data will be subjected to a Quality Assurance (QA) review prior to screening against storm water SLVs. Delta will additionally collect a duplicate sediment sample during one sampling event for QA/QC purposes.

Delta personnel will record field observations (including photographic documentation) to supplement and aid in the interpretation of analytical data. Delta will document conditions including ambient weather conditions, the approximate time that the storm event started, and the approximate time that runoff was first noted at the sampling point (this applies to overflow events only). Other conditions including odors, sheens, or the presence of debris will also be noted. Measurements of temperature and pH will be collected in the field.

6.4 Analytical Testing

Delta anticipates that storm water samples will be analyzed using the analytical parameters proposed for analysis of the catch basin sediment samples (see Section 4.0). However, it is likely that the storm water analytical parameters may be modified based on screening of analytical data for catch basin sediment samples against applicable SLVs.

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6.5 Screening Evaluation and Reporting

Delta will screen analytical data from storm water samples against applicable SLVs to assess the potential for impacts to the Willamette River. Exceedances of applicable SLVs may indicate additional measures including supplemental BMPs, modification of existing BMPs, or further evaluation is warranted.

Delta will prepare a summary report documenting the storm water sampling events. The report will include copies of laboratory analytical reports, COC documentation, and tables identifying the sampling location(s), compounds detected, laboratory method detection limits, and applicable SLVs. In addition, the report will include a discussion of COIs detected at concentrations above SLVs, the magnitude of the exceedances, and whether any Persistent Bioaccumulative Toxins (PBTs) were detected during the sampling events.

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REFERENCES

- Catch Basin Solid Sampling Standard Operating Procedures*, July 2003, CH2MHill on behalf of City of Portland (Attachment C of Appendix D, Portland Harbor JSCS)
- CSM Site Summary Update [Appendix A-5], Kinder Morgan Liquids Terminal – Linnton Petroleum Terminal, July 2006, Delta Environmental Consultants (Draft)
- Framework for Portland Harbor Storm Water Screening Evaluations*, December 2005, Department of Environmental Quality, Cleanup and Lower Willamette Section (Appendix D of Portland Harbor JSCS)
- How To Do Stormwater Sampling, A Guide for Industrial Facilities*, December 2002 (Revised January 2005), Washington State Department of Ecology.
- Portland Harbor Joint Source Control Strategy*, December 2005, Department of Environmental Quality and United States Environmental Protection Agency.
- Portland Harbor RI/FS – Round 2 Groundwater Pathway Assessment, Transition Zone Water Sampling, Field Sampling Report*, January 31, 2006, Integral Consulting Inc. on behalf of Lower Willamette Group.
- Remedial Investigation, Kinder Morgan Liquid Terminals, LLC, 11400 NW St. Helens Road, Portland, Oregon*, (October 2002), KHM Environmental Management, Inc

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TABLES

Table 1
Kinder Morgan Linnton Terminal
Facility Storm Water Outfalls and Discharges

Outfall Number / Discharge Location	Outfall/ Discharge Diameter (in)	Outfall/ Discharge Material	Basin Area (Acres)	Pervious/ Impervious (%)	Construction Date	Permit Type	Status	Current Land Uses	Historic Land Uses	Potential COIs	Comments
Outfall east of O/W Sep. No. 1. (WR-75 on Figure 1 of CSM)	Steel	8-inch	4	5/95 (Estimated)	Unk.	1300-J	Used only in high precip. events	Petroleum distrib. and office space	Unk.	TPH, PAHs, metals	The fueling racks, warehouse/office spaces, and asphalt-paved areas (Basin A) are serviced by this outfall when the capacity of Tank No. 3034 is exceeded during high precipitation events.
Outfall East of O/W Sep. No. 2. (WR-77 on Figure 1 of CSM)	Steel	8-inch	9	55/45 (Estimated)	Unk.	1300-J	Used only in high precip. events	Petroleum storage	Unk.	TPH, PAHs, metals	The upper and lower tank yards, pump enclosure, and associated areas (Basin B) are serviced by this outfall when the capacity of Tank No. 3034 is exceeded during high precipitation events.
Outfall east of Warehouse C. (WR-76 on Figure 1 of CSM)	Steel	4-inch	13	Not Available	Unk.	1300-J	Used under normal conditio	Petroleum distrib., storage, and office space	Unk.	TPH, PAHs, metals	Stormwater from all areas of the Site is routed to Tank No. 3034 for NPDES compliance testing. Permitted discharges under normal conditions (i.e. the capacity of Tank No. 3034 is not exceeded) enter the Willamette River from this outfall.

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FIGURES

